



ELECTRONICS

SAMSUNG SECRET

Product Information

Customer : General

DATE : May. 23. 2011

SAMSUNG TFT-LCD**MODEL : LTA400HF24**

The Information Described in this Specification is Preliminary and can be changed without prior notice

LCD Business

Samsung Electronics Co . , LTD.

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SAMSUNG SECRET**Revision History**

Date	Rev. No	Page	Summary
18. May. 2011	000	all	First issued

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General Description

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Description

LTA400HF24 is a color active matrix liquid crystal display (LCD) that uses amorphous silicon TFT (Thin Film Transistor) as switching components. This model is composed of a TFT LCD panel, a driver circuit and a back light unit.

The resolution of a 40.0" is 1920 x 1080 and this model can display up to 16.7 Million colors with wide viewing angle of 89° or higher in all directions. This panel is intended to support applications to provide excellent performance for Flat Panel Display such as Home-alone Multimedia TFT-LCD TV and High Definition TV.

Features

- RoHS compliance (Pb-free)
- High contrast ratio & aperture ratio with wide color gamut
- SPVA(Super Patterned Vertical Align) mode
- Wide viewing angle ($\pm 178^\circ$)
- High speed response
- FHD resolution (16:9)
- Low Power consumption
- Edge Type LED (Light Emitted Diode) BLU
- DE (Data Enable) mode
- 2ch LVDS (Low Voltage Differential Signaling) interface (2pixel/clock)

General Information

Items	Specification	Unit	Note
Module Size	921.7 (H_{TYP}) x 536.3 (V_{TYP})	mm	$\pm 1.0\text{mm}$
	30.5 (Max.)		
Weight	9.1 (Max.)	Kg	
Pixel Pitch	0.46125 (H) x 0.15375 (W)	mm	
Active Display Area	885.6 (H) x 498.15 (V)	mm	
Surface Treatment	Anti-glare	-	
Display Colors	8bit – 16.7M	Colors	
Number of Pixels	1920 x 1080	Pixel	
Pixel Arrangement	RGB vertical stripe	-	
Display Mode	Normally Black	-	
Luminance of White	400 (Typ.)	cd/m ²	

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1. Absolute Maximum Ratings

If the condition exceeds maximum ratings, it can cause malfunction or unrecoverable damage to the device.

Item	Symbol	Min.	Max.	Unit	Note
Power Supply Voltage	V_{DD}	GND-0.5	13.2	V	(1)
Storage temperature	T_{STG}	-20	60	°C	(2)
Glass surface temperature (Operation)	Center	T_{OPR}	0	50	°C
	T. Uniformity	ΔT	-	10	°C
Shock (non - operating)	S_{nop}	X, Y	-	30	G (3)
		Z	-	30	
Vibration (non - operating)	V_{nop}	-	1.5	G	(4)

Note (1) $T_a = 25 \pm 2$ °C

(2) Temperature and relative humidity range are shown in the figure below.

- a. 90 % RH Max. ($T_a \leq 39$ °C)
- b. Relative Humidity is 90% or less. ($T_a > 39$ °C)
- c. No condensation

(3) 11ms, sine wave, one time for ±X, ±Y, ±Z axis

(4) 10-300 Hz, Sweep rate 10min, 30min for X,Y,Z axis

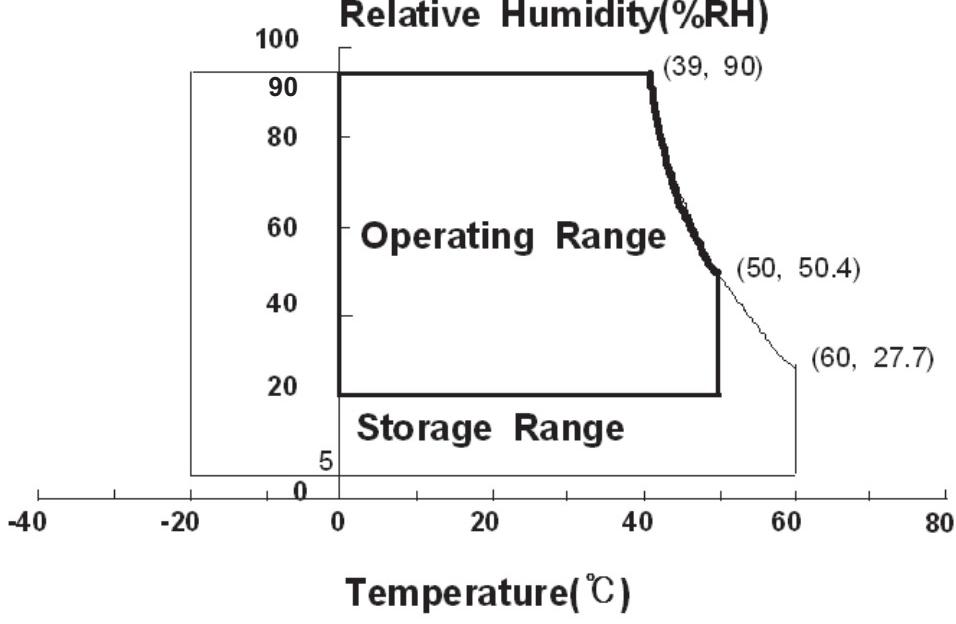


Fig. Temperature and Relative humidity range

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2. Optical Characteristics

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The optical characteristics should be measured in a dark room or equivalent.

Measuring equipment : TOPCON RD-80S, TOPCON SR-3 ,ELDIM EZ-Contrast

(Ta = 25 ± 2°C, VDD=12.0V, fv=120Hz, f_{DCLK}=297MHz, LED Current = 150 mA)

Item	Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio (Center of screen)	C/R	Normal θL,R=0 θU,D=0	3,000	4,000	-		(1) SR-3
Response Time	G-to-G		-	8	15	msec	(3) RD-80S
Luminance of White (Center of screen)	Y _L		300	400	-	cd/m ²	(4) SR-3
Color Chromaticity (CIE 1931)	Red	Viewing Angle	0.648	TYP. +0.03	TYP. -0.03		(5),(6) SR-3
	Ry		0.332				
	Green	Gx	0.306				
	Gy		0.592				
	Blue	Bx	0.149				
	By		0.064				
	White	Wx	0.280				
	Wy		0.290				
Color Gamut	-		-	70	-	%	(5) SR-3
Color Temperature	-		-	10,000	-	K	
Viewing Angle	Hor.	θ _L	75	89	-	Degree	(6) EZ-Contrast
		θ _R	75	89	-		
	Ver.	θ _U	75	89	-		
		θ _D	75	89	-		
Brightness Uniformity (9 Points)	B _{uni}		-	-	25	%	(2) SR-3

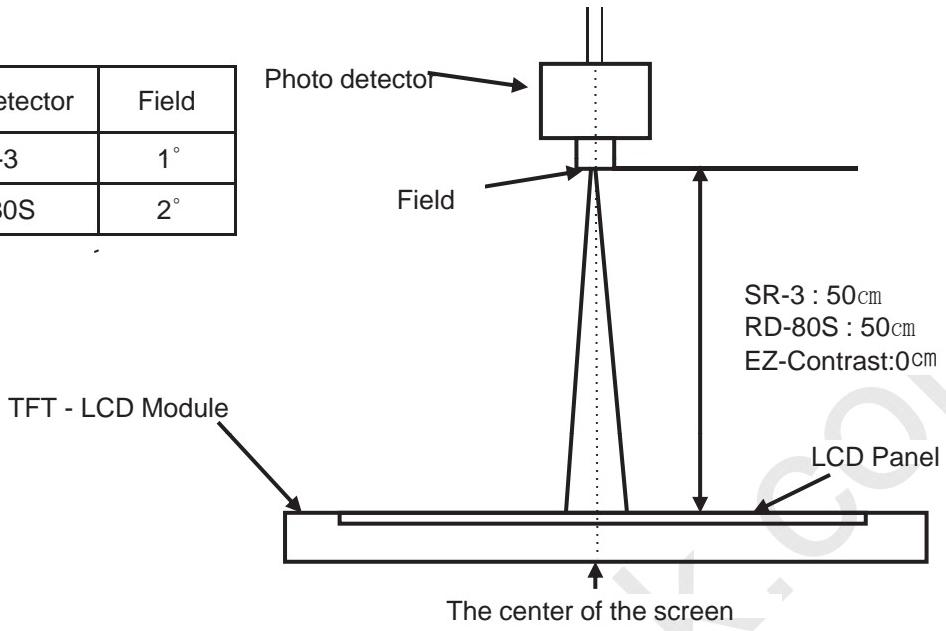
- Test Equipment Setup

The measurement should be executed in a stable, windless and dark room between 40min and 60min after lighting the back light at the given temperature for stabilization of the back light. This should be measured in the center of screen.

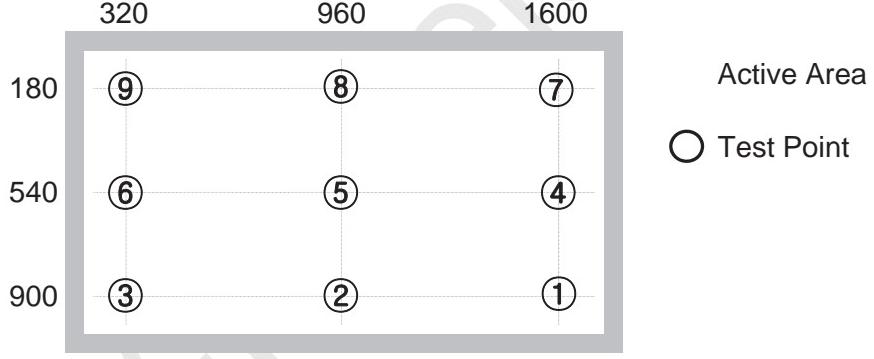
Environment condition : Ta = 25 ± 2 °C

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Photo detector	Field
SR-3	1°
RD-80S	2°



- Definition of test point



Note (1) Definition of Contrast Ratio (C/R)

: Ratio of gray max (Gmax) & gray min (Gmin) at the center point ⑤ of the panel

$$C / R = \frac{G_{\max}}{G_{\min}}$$

Gmax : Luminance with all pixels white

Gmin : Luminance with all pixels black

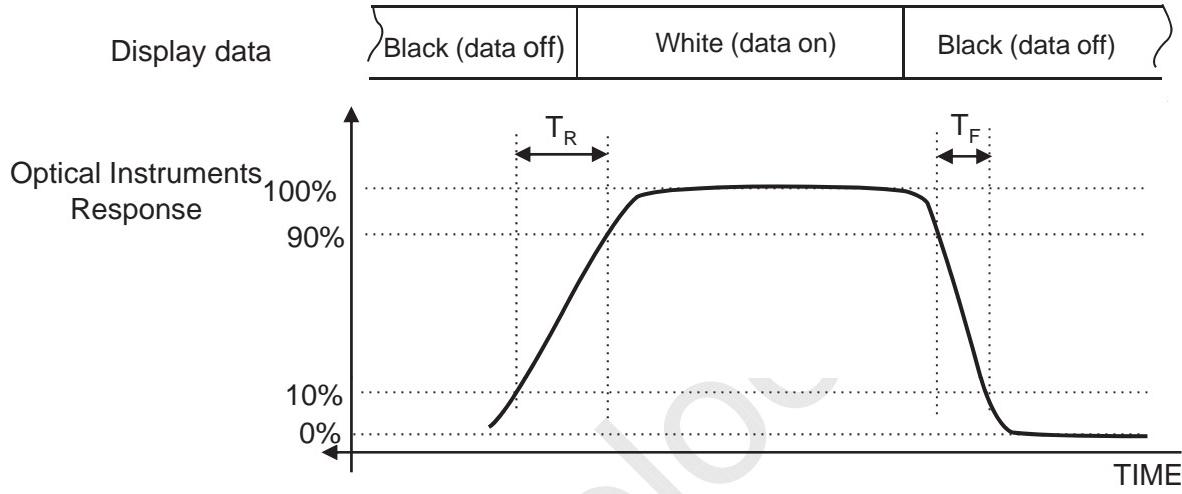
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Note (2) Definition of 9 points brightness uniformity (Test pattern : Full White)

$$B_{uni} = 100 * \frac{(B_{max} - B_{min})}{B_{max}}$$

B_{max} : Maximum brightness
B_{min} : Minimum brightness

Note (3) Definition of Response time : Sum of T_r, T_f



※ G-to-G : Average response time between Gray to Gray (Scale)

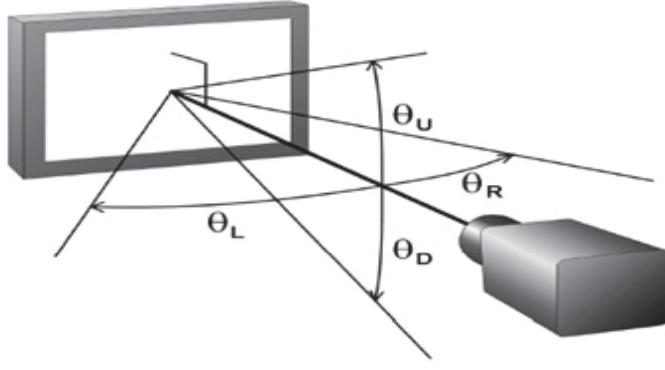
Note (4) Definition of Luminance of White : Luminance of white at center point ⑤

Note (5) Definition of Color Chromaticity (CIE 1931)

Color coordinate of Red, Green, Blue & White at center point ⑤

Note (6) Definition of Viewing Angle

: Viewing angle range (C/R ≥ 10)



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3. Electrical Characteristics

3.1 TFT LCD Module

The connector for display data & timing signal should be connected.

$T_a = 25^\circ\text{C} \pm 2^\circ\text{C}$

Item	Symbol	Min.	Typ.	Max.	Unit	Note
Voltage of Power Supply	V_{DD}	10.8	12.0	13.2	V	(1)
Current of Power Supply	I_{DD}	-	650	750	mA	(2),(3)
		-	650	750	mA	
		-	1065	1225	mA	
Vsync Frequency	f_V	95	120	125	Hz	
Hsync Frequency	f_H	120	135	140	kHz	
Main Frequency	F_{Dclk}	260	297	305	MHz	
Rush Current	I_{RUSH}	-	-	4	A	(4)

Note (1) The ripple voltage should be controlled under 10% of V_{DD} .

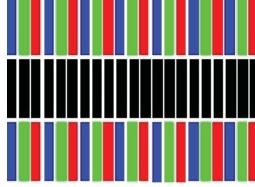
(2) $f_V=120\text{Hz}$, $f_{Dclk}=297\text{MHz}$, $V_{DD} = 12.0\text{V}$, DC Current.

(3) Power dissipation check pattern (LCD Module only)

a) Black Pattern

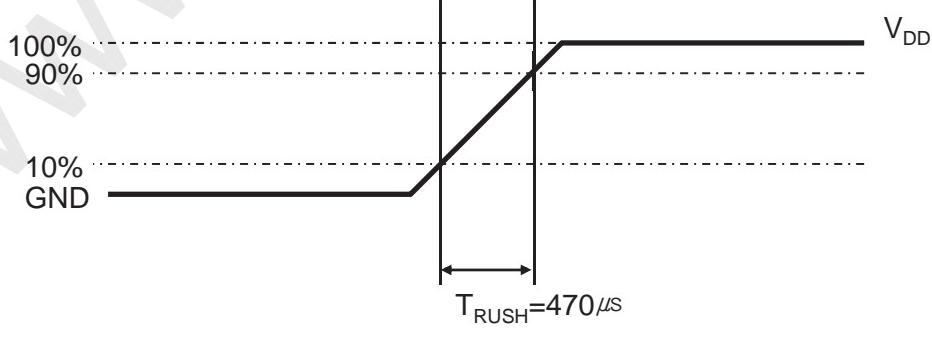


b) White Pattern



c) H-stripe

(4) Measurement Conditions



Rush Current I_{RUSH} can be measured when T_{RUSH} is $470\mu\text{s}$.

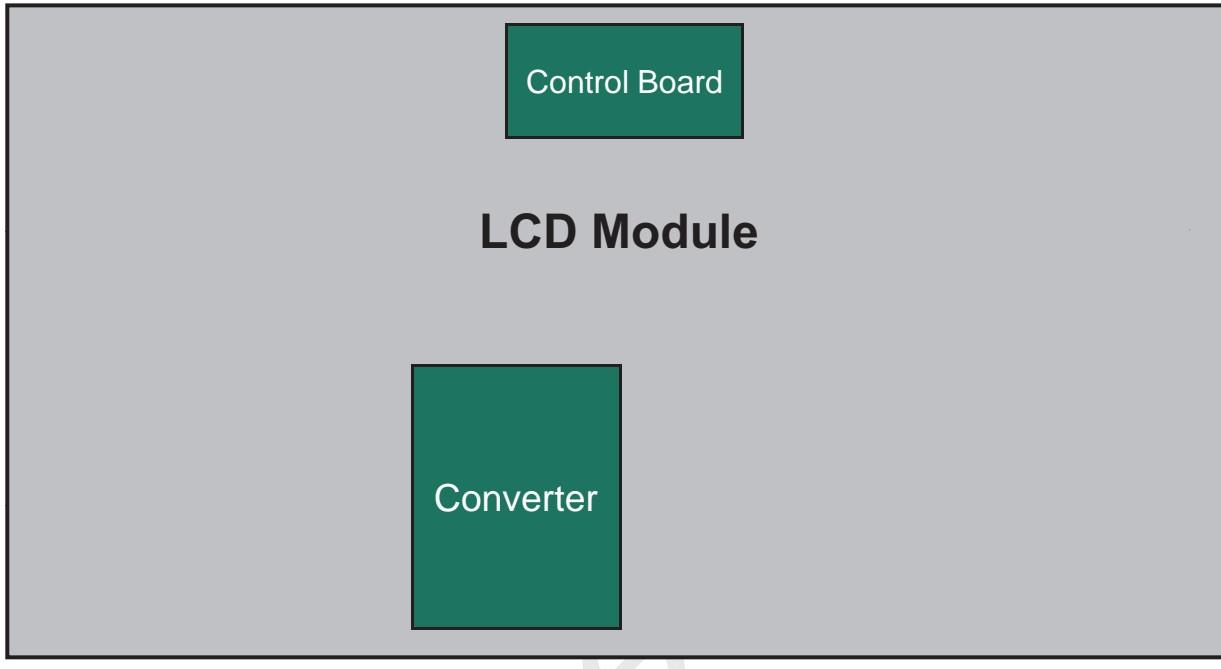
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3.2 Back Light Unit

The back light unit contains Edge type White LEDs (Light Emitting Diode)

T_a=25 ± 2°C



Item	Symbol	Min.	Typ.	Max.	Unit	Note
Operating Life Time	Hr	30,000	-	-	Hour	(1)

Note (1) It is defined as the time to take until the brightness reduces to 50% of its original value.

[Operating condition : T_a = 25±2°C , For single lamp only.]

3.3 Converter Input Condition & Specification

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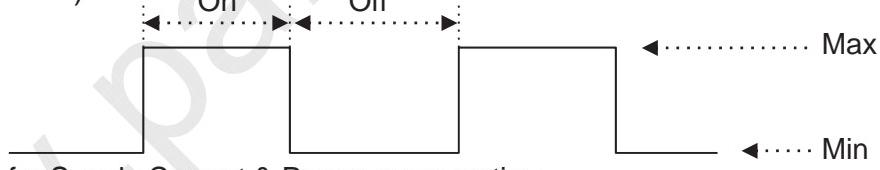
Items	Symbol	Conditions	Specifications			Unit	Note	
			Min.	Typ.	Max.			
Input Voltage	V _{in}	-	22	24	26	V	T _a =25±2 °C	
Input Current	I _{RUSH}	V _{in} =24.0V V _{dim} =3.3V	-	-	4.0	A		
Output Current	I _o	V _{in} =24.0V V _{dim} =3.3V	143	150	157	mArms	Note (1)	
Backlight On/Off	ON	V _{in} =24.0V	2.4	-	5.5	V	Note(2)	
	OFF	V _{in} =24.0V	0	-	0.8			
Dimming Range	V _{DIM}	V _{in} :22~26V	0	-	3.3	V		
Dimming Duty Output	D _{max}	V _{in} =24V Dim:3.3V	100	-	-	%		
	D _{min}	V _{in} =24V Dim:0V	-	1	-			
Dimming Frequency	F _{PWM}	V _{in} =24.0V	140	150	160	Hz		
External Dimming Duty Range	EX_Dim	V _{in} =22.0~26.0V Dim Pin(#13):floating	1	-	100	%		
External Dimming Frequency Range	F _{EX_PWM}		95	-	200	Hz		
External Dimming Signal Level	V _{PWM}	High (ON)	2.4	-	5.5	V		
		Low (Off)	0	-	0.8			

Note) Power Consumption is measured when 400 [cd/m²] of luminance which is the typical luminance.

(1) All data is measured after 120min warm-up.

(2) SEC only guarantees that waterfall will not happen in internal dimming mode with sync cable between converter and T-con board.

(3) Duty = On / (On+Off) * 100



- Additional Appendix for Supply Current & Power consumption

Items	Symbol	Conditions	Min.	Typ.	Max.	Unit
Input Current	lin_overshoot	V _{in} =24V, Dim=3.3V (Within 1hr at BLU on)	-	3.5	3.6	A
	lin_saturation	V _{in} =24V, Dim=3.3V (After 1hr Aging)	-	2.82	2.9	A
Power Consumption (Back light)	P_Inrush	V _{in} =24.0V, V _{dim} =3.3V	-	-	96	Watt
	P_overshoot	V _{in} =24V, Dim=3.3V (Within 1hr at BLU on)	-	84	87	Watt
	P_saturation	V _{in} =24V, Dim=3.3V (After 1hr Aging)	-	68	70	Watt

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4. Input Terminal Pin Assignment

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4.1.1 Input Signal & Power

Connector : FI-RE41S-HF (JAE/UJU)

Pin	Description	Pin	Symbol	Description
1	Vdd(12V)	21		Rx1[3]P
2	Vdd(12V)	22		No Connection
3	Vdd(12V)	23		No Connection
4	Vdd(12V)	24		GND
5	Vdd(12V)	25		Rx3[0]N
6	No Connection	26		Rx3[0]P
7	GND	27		Rx3[1]N
8	GND	28		Rx3[1]P
9	GND	29		Rx3[2]N
10	ODD LVDS SIGNAL	Rx1[0]N	30	Rx3[2]P
11		Rx1[0]P	31	GND
12		Rx1[1]N	32	Rx3CLK-
13		Rx1[1]P	33	Rx3CLK+
14		Rx1[2]N	34	GND
15		Rx1[2]P	35	Rx3[3]N
16		GND	36	Rx3[3]P
17		Rx1CLK-	37	No Connection
18		Rx1CLK+	38	No Connection
19		GND	39	GND
20		Rx1[3]N	40	No Connection
			41	No Connection

Note) No Connection : This PINS Should be disconnected because of SEC internal design.

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4.1.2 Input Signal & Power

Connector : FI-RE51S-HF (JAE/UJU)

Pin	Description	Pin	Description	
1	Vdd(12V)	26	EVEN LVDS SIGNAL	Rx4[0]P
2	Vdd(12V)	27		Rx4[1]N
3	Vdd(12V)	28		Rx4[1]P
4	Vdd(12V)	29		Rx4[2]N
5	Vdd(12V)	30		Rx4[2]P
6	No Connection	31		GND
7	GND	32		Rx4CLK-
8	GND	33		Rx4CLK+
9	GND	34		GND
10	EVEN LVDS SIGNAL	35		Rx4[3]N
11		36		Rx4[3]P
12		37		No Connection
13		38		No Connection
14		39		GND
15		40		SEC Internal Only (Note 1)
16		41		SEC Internal Only (Note 1)
17		42		No Connection
18		43		SEC Internal Only (Note 1)
19		44		SEC Internal Only (Note 1)
20		45		SEC Internal Only (Note 1)
21		46		SEC Internal Only (Note 1)
22		47		SEC Internal Only (Note 1)
23		48		No Connection
24		49		No Connection
25		50		SEC Internal Only (Note 1)
		51		SEC Internal Only (Note 1)

Note) No Connection : This PINS Should be disconnected because of SEC internal design.

Note (1) SEC internal Only: These PINS are used only for SAMSUNG. (DO NOT CONNECT)

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Note3) Pin number starts from Right side

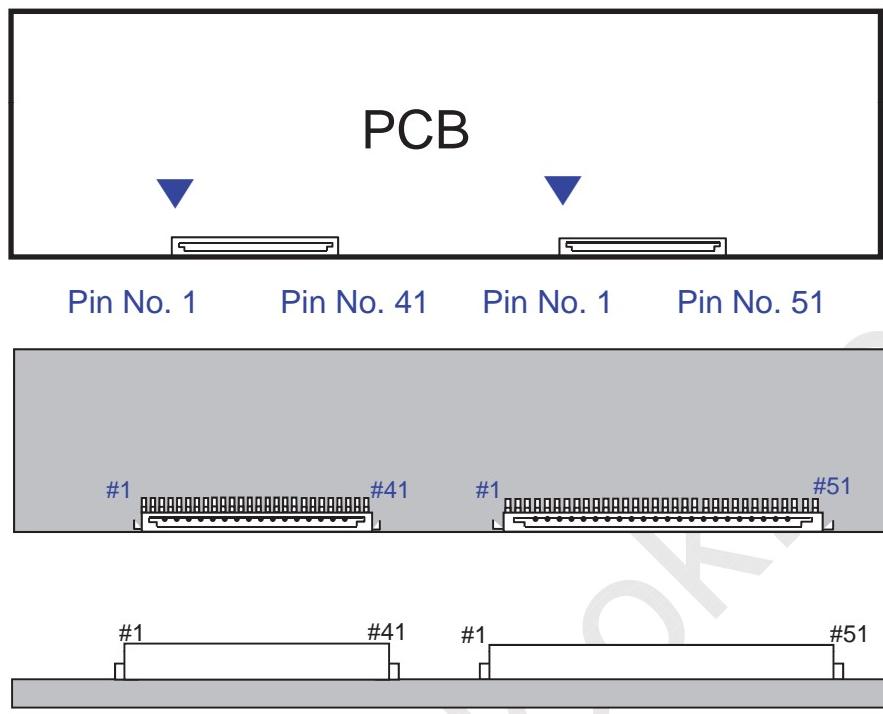


Fig. Connector diagram

- All GND pins should be connected together and also be connected to the LCD's metal chassis.
- All power input pins should be connected together.
- All NC pins should be separated from other signal or power.

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4.2. Inverter Input Pin Configuration

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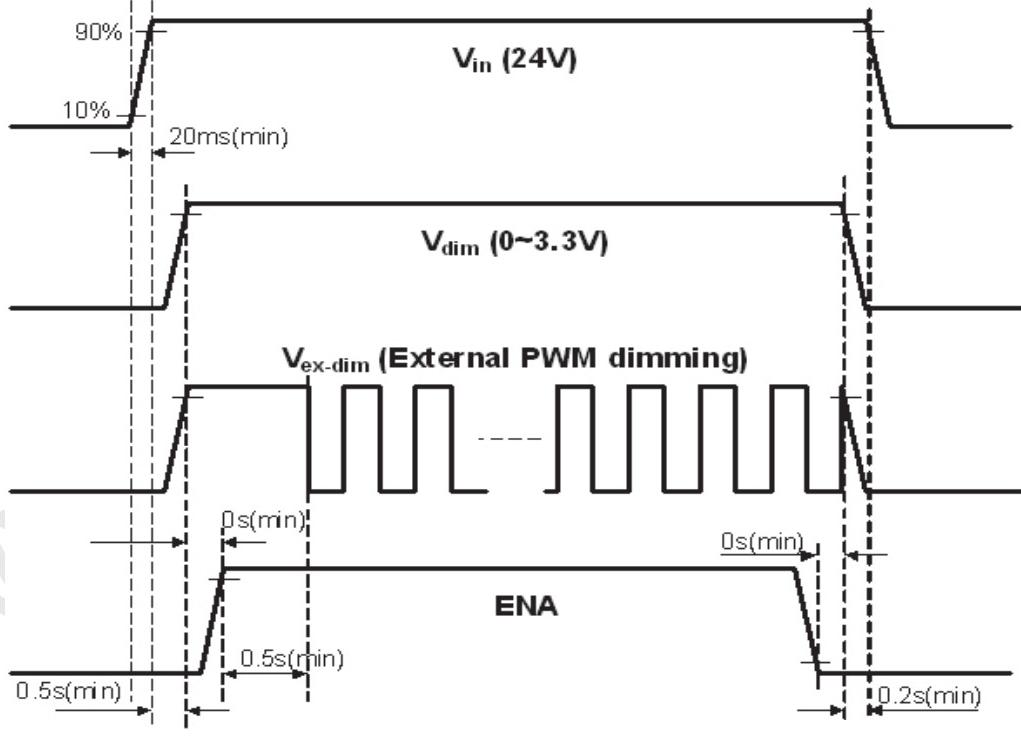
Connector : Yeon-ho, 20022WR-14B1

Pin No.	Pin Configuration(FUNCTION)
	Master
1 ~5	24 V
6~10	GND
11	Error Out
12	Backlight On /Off [ON: 2.4 – 5.5 V, OFF: 0 - 0.8 V]
13	Dimming Control [0V:Min, 3.3V:Max] *Note(1)
14	External PWM [1~100%] *Note(1)

Note(1) If use Dimming Control, Pin 14 Must be N.C

If use External PWM, Pin 13 Must be N.C

4.3. Inverter Input Power Sequence



Note) SEQUENCE : ON = Vin(24V) > Dimming Control ≥ Backlight On/Off
OFF = Backlight On/Off ≥ Dimming Control > Vin(24V)

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4.4 LVDS Interface

- LVDS Receiver : T-con (merged)
- Data Format (JEIDA Only)

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	LVDS pin	JEIDA -DATA
TxOUT/RxIN0	TxIN/RxOUT0	R4
	TxIN/RxOUT1	R5
	TxIN/RxOUT2	R6
	TxIN/RxOUT3	R7
	TxIN/RxOUT4	R8
	TxIN/RxOUT6	R9
	TxIN/RxOUT7	G4
TxOUT/RxIN1	TxIN/RxOUT8	G5
	TxIN/RxOUT9	G6
	TxIN/RxOUT12	G7
	TxIN/RxOUT13	G8
	TxIN/RxOUT14	G9
	TxIN/RxOUT15	B4
	TxIN/RxOUT18	B5
TxOUT/RxIN2	TxIN/RxOUT19	B6
	TxIN/RxOUT20	B7
	TxIN/RxOUT21	B8
	TxIN/RxOUT22	B9
	TxIN/RxOUT24	HSYNC
	TxIN/RxOUT25	VSYNC
	TxIN/RxOUT26	DEN
TxOUT/RxIN3	TxIN/RxOUT27	R2
	TxIN/RxOUT5	R3
	TxIN/RxOUT10	G2
	TxIN/RxOUT11	G3
	TxIN/RxOUT16	B2
	TxIN/RxOUT17	B3
	TxIN/RxOUT23	RESERVED
TxOUT/RxIN4	TxIN/RxOUT28	R0
	TxIN/RxOUT29	R1
	TxIN/RxOUT30	G0
	TxIN/RxOUT31	G1
	TxIN/RxOUT32	B0
	TxIN/RxOUT33	B1
	TxIN/RxOUT34	RESERVED

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4.5 Input Signals, Basic Display Colors and Gray Scale of Each Color

COLOR	DISPLAY (8bit)	DATA SIGNAL																								GRAY SCALE LEVEL	
		RED							GREEN							BLUE											
		R0	R1	R2	R3	R4	R5	R6	R7	G0	G1	G2	G3	G4	G5	G6	G7	B0	B1	B2	B3	B4	B5	B6	B7		
BASIC COLOR	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-	
	GREEN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	
	CYAN	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	
	RED	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	
	MAGENTA	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	-	
	YELLOW	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	-	
	WHITE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	-	
GRAY SCALE OF RED	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R0	
	DARK ↑	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R1	
	DARK ↓	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R2	
	LIGHT ↑	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	R3~R252		
	LIGHT ↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
	1	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R253		
	RED	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	R254	
GRAY SCALE OF GREEN	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G0	
	DARK ↑	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G1	
	DARK ↓	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	G2	
	LIGHT ↑	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	G3~G252		
	LIGHT ↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G253		
	GREEN	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	G254	
GRAY SCALE OF BLUE	BLACK	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	B0	
	DARK ↑	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	B1	
	DARK ↓	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	B2	
	LIGHT ↑	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	B3~B252		
	LIGHT ↓	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:			
	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	1	1	B253		
	BLUE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	B254	

Note) Definition of Gray :

Rn : Red Gray, Gn : Green Gray, Bn : Blue Gray (n = Gray level)

Input Signal : 0 = Low level voltage, 1 = High level voltage

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5. Interface Timing

5.1 Timing Parameters (DE mode)

SIGNAL	ITEM	SYMBOL	MIN.	TYP.	MAX.	Unit	NOTE
Clock	Frequency	$1/T_C$	260	297	305	MHz	-
Hsync		F_H	120	135	140	KHz	-
Vsync		F_V	95	120	125	Hz	-
Vertical Display Term	Active Display Period	T_{VD}	-	1080	-	Lines	-
	Vertical Total	T_V	1090	1125	1380	Lines	-
Horizontal Display Term	Active Display Period	T_{HD}	-	1920	-	Clocks	-
	Horizontal Total	T_H	2090	2200	2350	clocks	-

Note) This product is DE mode. But the Hsync & Vsync signal must be inputted

- (1) Test Point : TTL control signal and CLK at LVDS Tx input terminal in system
- (2) Internal VDD = 3.3V
- (3) Spread spectrum
 - Modulation rate (max) : $\pm 1.5\%$
 - Modulation Frequency : under 100KHz

5.2 LVDS Input Data Characteristics

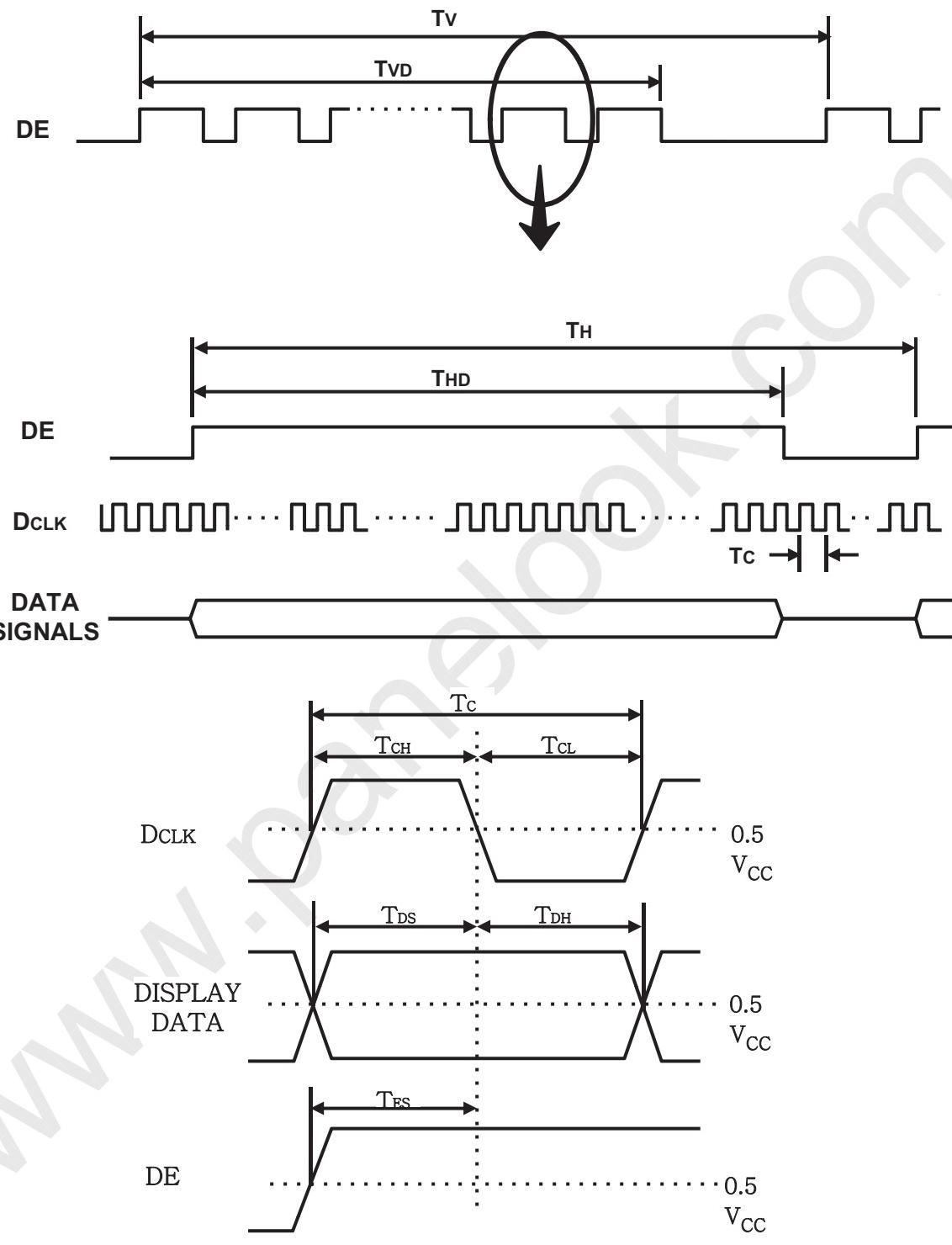
ITEM		SYMBOL	Min.	Typ.	Max.	UNIT	NOTE	
Input Data Position	$F_{IN}=78MHz$	t_{RSRM}	-	-	450	ps		
		t_{RSLM}	-450	-	-	ps		
Input common mode voltage		V_{CM}	0.3	-	1.8	V	-	
Differential Input Voltage		$ V_{ID} $	200	-	600	mV	-	

Note) When the skew is measured the Spread Spectrum should be 0%

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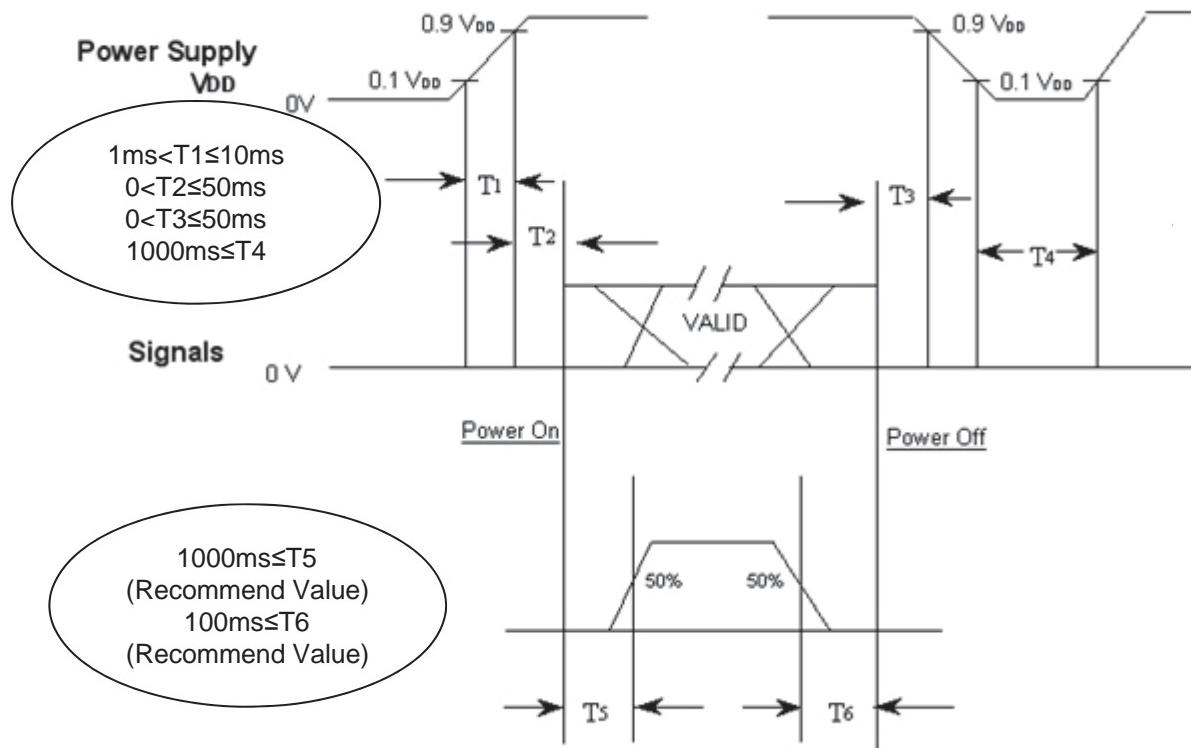
5.3 Timing diagrams of interface signal (DE only mode)



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5.4 Power ON/OFF Sequence

To prevent a latch-up or DC operation of the LCD Module, the power on/off sequence should be as the diagram below.



T_1 : V_{DD} rising time from 10% to 90%

T_2 : The time from V_{DD} to valid data at power ON.

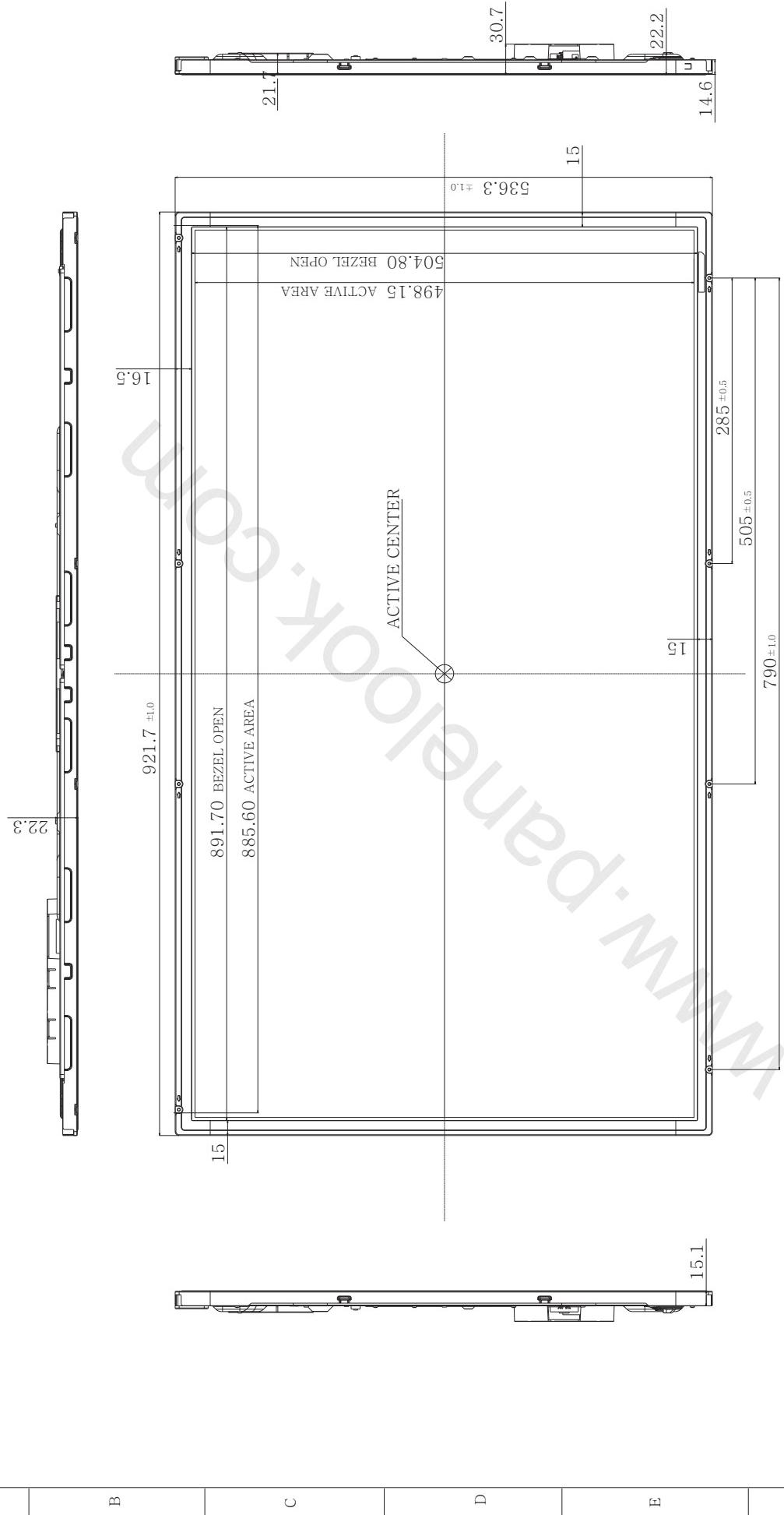
T_3 : The time from valid data off to V_{DD} off at power Off.

T_4 : V_{DD} off time for Windows restart

T_5 : The time from valid data to B/L enable at power ON.

T_6 : The time from valid data off to B/L disable at power Off.

- The supply voltage of the external system for the Module input should be the same as the definition of V_{DD} .
- Apply the lamp voltage within the LCD operation range. When the back light turns on before the LCD operation or the LCD turns off before the back light turns off, the display may momentarily show abnormal screen.
- In case of $V_{DD} = 0$ level, please keep the level of input signals low or keep a high impedance.
- T_4 should be measured after the Module has been fully discharged between power off and on period.
- Interface signal should not be kept at high impedance when the power is on.

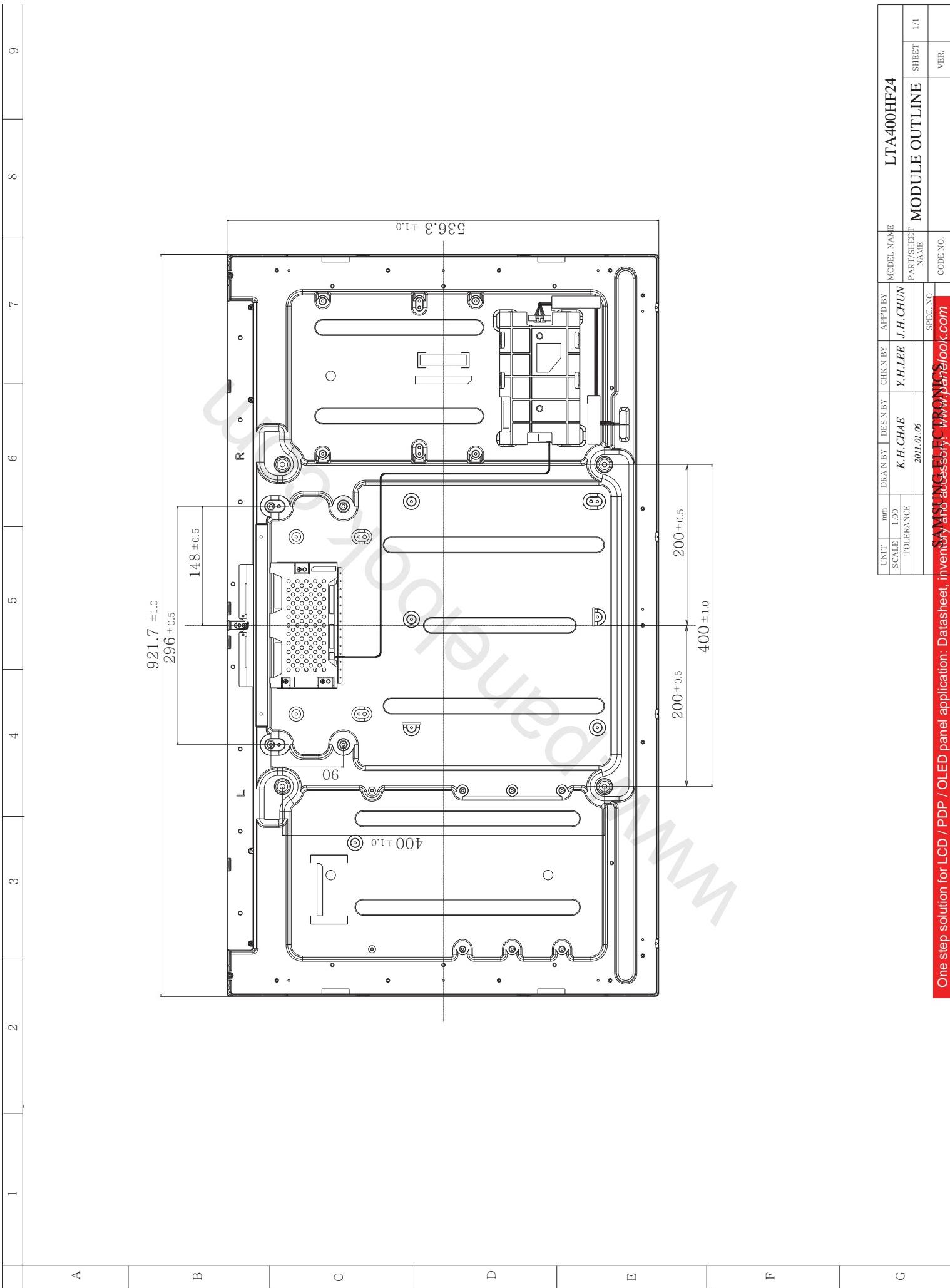


UNIT	mm	DRAWN BY	DES'D BY	CHK'D BY	APPR'D BY	MODEL NAME	LTA400HF24
SCALE	1:00		K.H.CHAE	Y.H.LEE	J.H.CHUN	PART/SHEET NAME	
TOLERANCE						NAME	
						SPEC. NO.	
						CODE NO.	

One step solution for LCD/PDP/OLED panel application: Datasheet, inventory & accesssing www.panellook.com

VER.

1/V



UNIT mm		DRAWN BY	DESIN BY	CHKIN BY	APPD BY	MODEL NAME	LTA400HF24	
SCALE 1.00	TOLERANCE	K.H.CHAE		Y.H.LEE	J.H.CHUN	PART/SHEET NAME	MODULE OUTLINE	SHEET 1/1
					2011.01.06			
						SPEC. NO.		
						CODE NO.		

One step solution for LCD /PDP /OLED panel application: Datasheet, inventory, accessories, www.panlook.com

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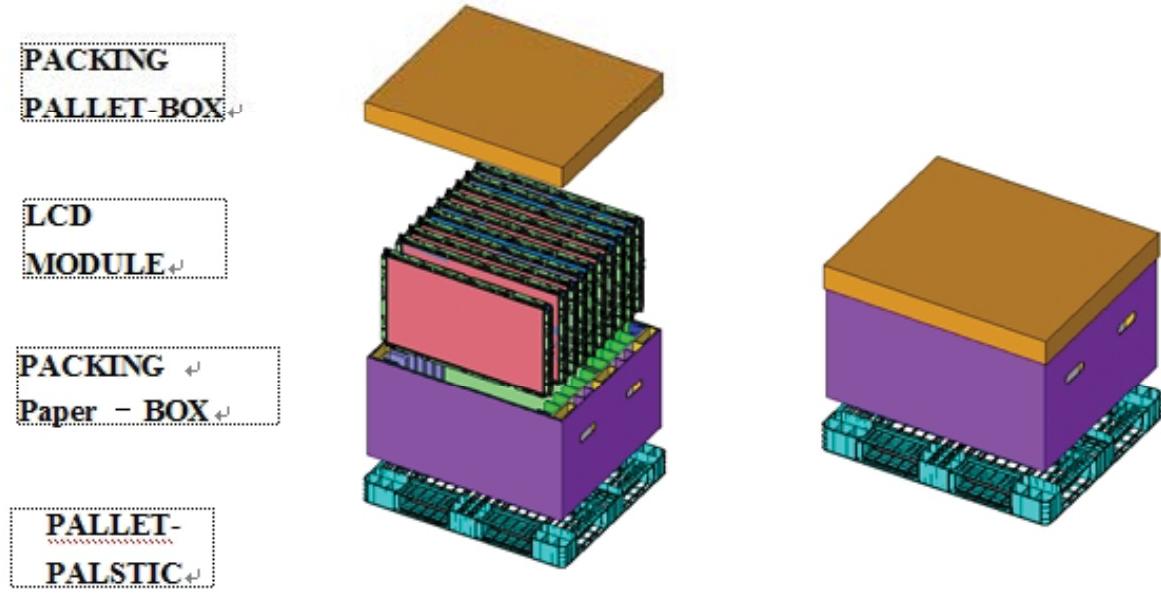
7. PACKING

7.1 CARTON (Internal Package)

(1) Packing Form

Corrugated fiberboard box and corrugated cardboard as shock absorber

(2) Packing Method



7.2 Packing Specification

ITEM	Specification	Remark
LCD Packing	21ea / Box (Packing-Pallet Box)	1. 8.6Kg / LCD (21ea) 2. 14 Kg / Packing Set 3. Packing Material : Paper
Pallet-Plastic	1Box / Pallet	1. Pallet weight = 5.3kg
Packing Direction	Vertical	
Pallet size	H x V x height	1150mm(H) x 985mm(V) x 711mm(height)
Pallet weight	200.74kg	Module(8.6kgx21=180.6kg) + Pallet(5.3kg)+ Packing SET(14kg) + Desiccant(0.04kgx21=0.84kg)

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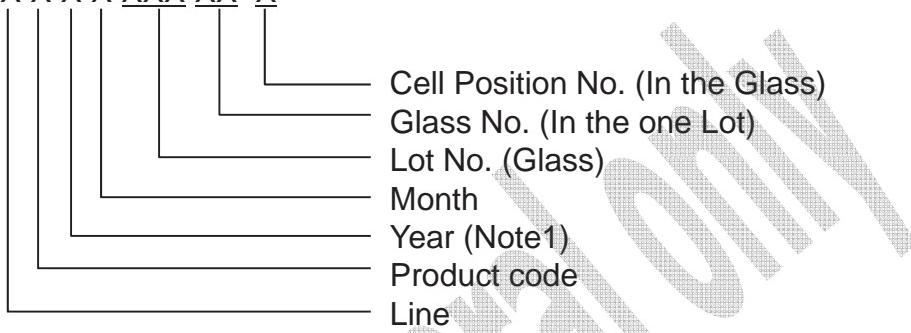
8. MARKING & OTHERS

A nameplate bearing followed by is affixed to a shipped product at the specified location on each product.

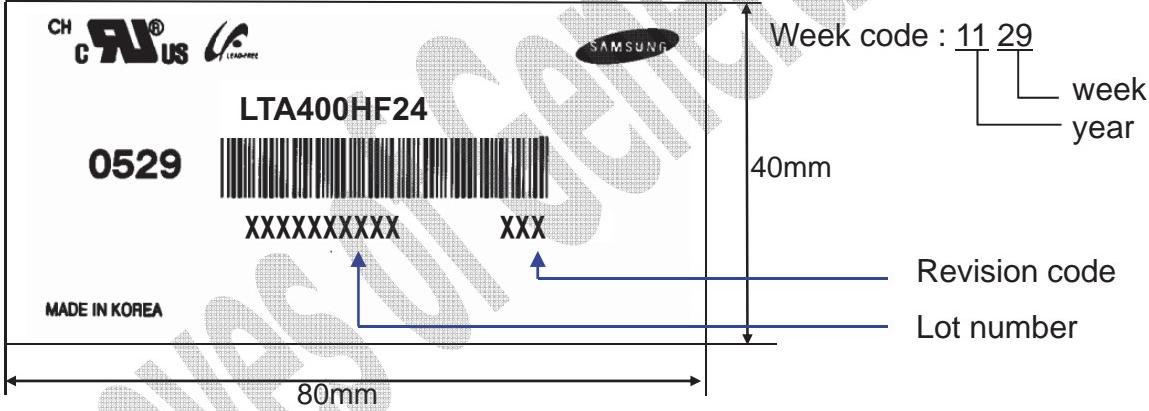
(1) Part number : LTA400HF24

(2) Revision: Three letters

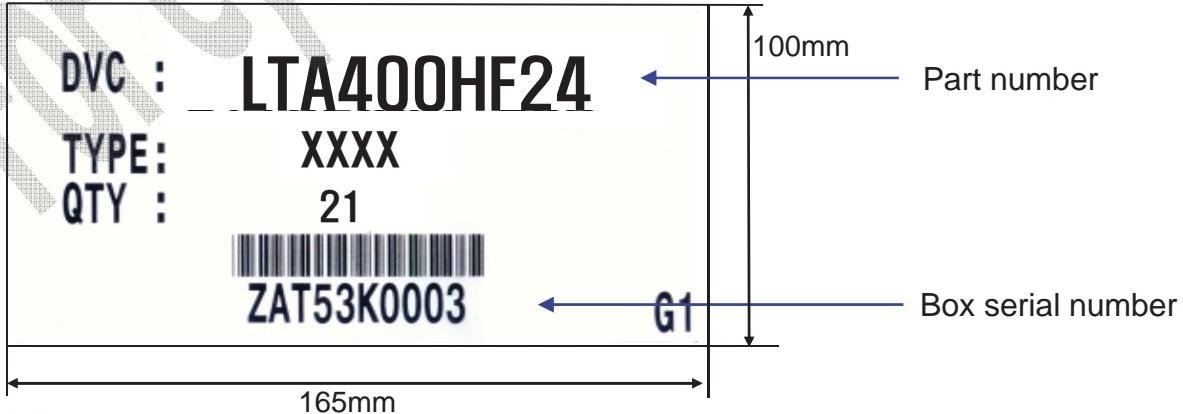
(3) Lot number : X X X X XXX XX X



(4) Nameplate Indication



(5) Packing box attach



(6) Others

1. After service part

Lamps cannot be replaced because of the narrow bezel structure.

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9. General Precautions

9.1 Handling

- (a) When the Module is assembled, it should be attached to the system firmly using all mounting holes. Be careful not to twist and bend the Module.
- (b) Because the inverter use high voltage, it should be disconnected from power before it is assembled or disassembled.
- (c) Refrain from strong mechanical shock and / or any force to the Module.
In addition to damage, this may cause improper operation or damage to the Module and CCFT back light.
- (d) Note that polarizers are very fragile and could be damage easily.
Do not press or scratch the surface harder than a HB pencil lead.
- (e) Wipe off water droplets or oil immediately. If you leave the droplets for a long time, staining or discoloration may occur.
- (f) If the surface of the polarizer is dirty, clean it using absorbent cotton or soft cloth.
- (g) Desirable cleaners are water, IPA(Isopropyl Alcohol) or Hexane.
Do not use Ketone type materials(ex. Acetone), Ethyl alcohol, Toluene, Ethyl acid or Methyl chloride. It might permanent damage to the polarizer due to chemical reaction.
- (h) If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth . In case of contact with hands, legs or clothes, it must be washed away with soap thoroughly.
- (i) Protect the module from Electrostatic discharge. Otherwise the ASIC IC or semiconductor would be damaged.
- (j) Use finger-stalls with soft gloves in order to keep display clean during the incoming inspection and assembly process.
- (k) Do not disassemble the Module.
- (l) Do not disassemble shield case of inverter & LVDS board
- (m) Do not connect N.C pins. (Samsung internal use only)
- (n) Protection film for polarizer on the Module should be slowly peeled off just before use so that the electrostatic charge can be minimized. Must put on antistatic glove while handling a module
- (o) Pins of I/F connector should not be touched directly with bare hands.

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9.2 Storage

(a) Do not leave the Module in high temperature, and high humidity for a long time.
It is highly recommended to store the Module with temperature from 0 to 35°C and relative humidity of less than 70%.

(b) Do not store the TFT-LCD Module in direct sunlight.

(c) The Module should be stored in a dark place. It is prohibited to apply sunlight or fluorescent light in storing.

(d) Storage condition of Packing

ITEM	UNIT	Min.	Max.
Storage Temperature	(°C)	5	40
Storage Humidity	(%rH)	35	75
Storage Life	12 months		
Storage Condition	<ul style="list-style-type: none"> - Prohibit direct sunlight - Ventilation in storehouse and control changing temperature is within limits of environment - Put it on pallet and store them with removing from wall. - Don't wet Out-BOX and avoid rain. - Without condensation. - Etc. Avoid harmful Condition 		
Long-term Storage Process	<ul style="list-style-type: none"> -More than 3 months Storage or Low temp. Delivery/under 5°C storage → On the 20°C, 50%rH Condition, more than 10hr release. 		

9.3 Operation

(a) Do not connect or disconnect the Module in the "Power On" condition.

(b) Power supply should always be turned on/off by the "Power on/off sequence"

(c) Module has high frequency circuits. Sufficient suppression to the electromagnetic interference should be done by system manufacturers. Grounding and shielding methods may be important to minimize the interference.

(d) The cable between the back light connector and its inverter power supply should be connected directly with a minimized length. A longer cable between the back light and the inverter may cause lower luminance of lamp(CCFT) and may require higher startup voltage(Vs).

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9.4 Operation Condition Guide

- (a) The LCD product should be operated under normal conditions.

Normal condition is defined as below;

- Temperature : $20 \pm 15^\circ\text{C}$
- Humidity : $55 \pm 20\%$
- Display pattern : continually changing pattern (Not stationary)

- (b) If the product will be used in extreme conditions such as high temperature, humidity, display patterns or operation time etc.., It is strongly recommended to contact SEC for Application engineering advice. Otherwise, its reliability and function may not be guaranteed. Extreme conditions are commonly found at Airports, Transit Stations, Banks, Stock market, and Controlling systems.

9.5 Others

- (a) Ultra-violet ray filter is necessary for outdoor operation.

- (b) Avoid condensation of water. It may result in improper operation or disconnection of electrode.

- (c) Do not exceed the absolute maximum rating value. (supply voltage variation, input voltage variation, variation in part contents and environmental temperature, and so on)

Otherwise the Module may be damaged.

- (d) If the Module keeps displaying the same pattern for a long period of time, the image may be "sticked" to the screen.

To avoid image sticking, it is recommended to use a screen saver.

- (e) This Module has its circuitry PCB's on the rear side and should be handled carefully in order not to be stressed.

- (f) Please contact SEC in advance when you display the same pattern for a long time.

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